Rapid documented growth of aneurysm bleb led to rupture of an incidental intracranial anterior communicating artery (Acom) aneurysm

Burkhardt, Jan-Karl ; Fierstra, Jorn ; Esposito, Giuseppe ; Baltsavias, Gerasimos ; Bozinov, Oliver ; Regli, Luca

Abstract: Background A major challenge in the management of patients with unruptured intracranial aneurysms (UIAs) is the identification of criteria indicating a higher risk of future UIA rupture. Here we report a rare patient with documented short-term bleb growth of an UIA followed by fatal aneurysm rupture supporting the high-risk of rupture of short-term shape changes in UIAs. Case description A 72 year old man with an incidental unruptured anterior communicating artery aneurysm of 9 mm showed a bleb growth on the aneurysm sac at a 6 week follow-up CTA. Aneurysm treatment was recommended by the interdisciplinary board (PHASES score: 9 points, rupture risk 4.3%/5years). The patient wanted to discuss treatment plan with his family before final decision for treatment. Two days after the CTA showing bleb grwoth he was admitted emergently with a severe SAH (WFNS 5, Fisher 3). The aneurysm was occluded with coils. However, the patient died on day 14 after SAH due to delayed ischemic neurological deficits and multiple organ failure. Conclusions This case illustrates the high rupture risk of an UIA presenting a documented growth of an aneurysm bleb over a short follow-up time. In retrospect, this patient might have benefitted from emergent aneurysm occlusion. The interest of this report comes from the prove that aneurysmal bleb growth constitutes a high risk for short-term aneurysm rupture.

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Disclosure: The patient next of kin/guardian has consented to submission of this case report to the journal.

Abstract

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Keywords: anterior communicating artery aneurysm, subarachnoid hemorrhage, aneurysm bleb, aneurysm bleb growth

Introduction

Patients diagnosed with incidental unruptured intracranial aneurysms are selected for either surgical or endovascular aneurysm occlusion based on weighing up aneurysm rupture risk with treatment risk factors.[1-3] Besides age, genetical risk factors and the event of previous subarachnoid hemorrhage (SAH), radiological aneurysm characteristics have to be taken in account.[1,2,4] Aneurysm size is the most important risk factor followed by aneurysm configuration changes including aneurysm size progression.[4,5] In addition, the coexistence of an aneurysm associated bleb, which is defined as an additional bulge on the aneurysm sac itself, is also described as a high risk factor for aneurysm rupture.[6-8] Based on radiological flow models, the cause for such a bleb formation is thought to be the point of maximal wall shear stress within in the aneurysm.[9,10] *De novo* development of aneurysm blebs or the combination of aneurysm growth with novel bleb formation are well known in the literature.[7,11-13] These dynamic changes of the aneurysm are considered to be a high risk for aneurysm rupture.[12-14] However, a radiological documented bleb growth followed by aneurysm rupture is not reported in the literature.

We report here about a rare case of a radiologically confirmed aneurysm bleb growth in a short-term follow-up CTA in a patient presenting an incidental unruptured anterior communicating artery aneurysm (Acom), which was rapidly followed by a fatal aneurysm rupture.

Case presentation

This 72 year old patient was operated on a symptomatic traumatic chronic subdural hematoma with burr holes and recovered completely from his partial hemiparesis after surgery. During this initial admission, the CTA showed an incidental unruptured polylobulated Acom aneurysm with a maximal size of 9 mm and a coexisting aneurysm bleb (Figure 1). The interdisciplinary neurovascular board recommended treatment of the UIA by microsurgical clipping after a short recovery period for the subdural hematoma surgery. The indication for surgical aneurysm occlusion was based on the following two factors: aneurysm size and the irregular shape with an associated bleb. The PHASES score indicated 9 points, suggesting a rupture risk of 4.3%/5years[1]. Microsurgical clipping was recommended due to the wide aneurysm base with complete incorporation of the Acom and extension of the sac anteriorly and posteriorly. Indication for treatment was discussed with the patient. He wished to discuss decision of aneurysm treatment at the first follow-up visit for the subdural hematoma at 6 weeks.

At 6 weeks follow-up visit the patient was perfectly well without any residual focal neurological deficits. A follow-up CT/CTA showed no change in overall aneurysm size, however growth of the aneurysmal bleb was noticed. (Figure 2) This further supported the initial treatment recommendation of the UIA. Despite the explanations suggesting a high risk of rupture the patient did not agree with immediate aneurysm treatment and wanted to re-discuss the situation with his family the following week. Two days after the CTA and the outpatient visit, he was admitted to the emergency room with a GCS 3. CT showed a severe SAH (Fisher 3, BNI grading scale 4[15]) and also intracerebral and intraventricular hemorrhage due to the rupture of the known Acom aneurysm (WFNS 5) (Figure 3). An emergent external ventricular drain was inserted and the aneurysm was treated by coiling due to the instable clinical condition of the patient (Figure 4). The aneurysm bled was confirmed during digital subtraction angiography (DSA) (Figure 2C). He was treated on the neurosurgical ICU

according to the standard SAH protocol. Unfortunately, the patient died on day 14 after SAH due to delayed ischemic neurological deficits and multiple organ failure.

Discussion

We present a rare case of a patient with fatal aneurysm rupture of an initially unruptured incidental Acom aneurysm short after a growth of an aneurysm bleb was documented on follow-up CTA. To our knowledge this is the first case described in the literature with a radiologically confirmed bleb growth, which ruptured acutely two days after confirmed bleb growth. The interest of this unique case report comes from the prove that changes of aneurysmal blebs constitute a high risk for short-term aneurysm rupture.

Suga et al. described a case of a 75 year old Japanese patient with a basilar trunc aneurysm, which grew after 1 year of follow-up with a novel aneurysm bleb.[7] This patient was followed-up and aneurysm rupture occurred 8 months later. The patient died from the severe SAH, but it is unclear if aneurysm-bleb growth occurred within the last 8 months before aneurysm rupture. Another study report about three patients with new bleb formation at the time point of aneurysm rupture.[12] It remains unclear, if these patients showed a bleb growth before rupture. Villablanca et al. also report about one patient with a known aneurysm bleb and rupture without reported bleb growth.[13,14] The authors also presented 6 patients with radiologically documented bleb growth, and aneurysm rupture could be prevented by aneurysm occlusion.[13] Our patient would have belonged to this category, if he would not have declined immediate aneurysm treatment. Although it is known that aneurysm configuration changes including aneurysm bleb growth are high risk factors for aneurysm rupture,[8,12-14] our report shows for the first time the short-term fatal aneurysm rupture 2 days after documented bleb growth. In retrospect we would have better helped the patient by treating his aneurysm as soon as we

documented a growth in the aneurysmal sac bleb and patients presenting with a short-term change or growth of an aneurysmal bleb in UIAs as in this case presentation should be considered for emergent treatment.

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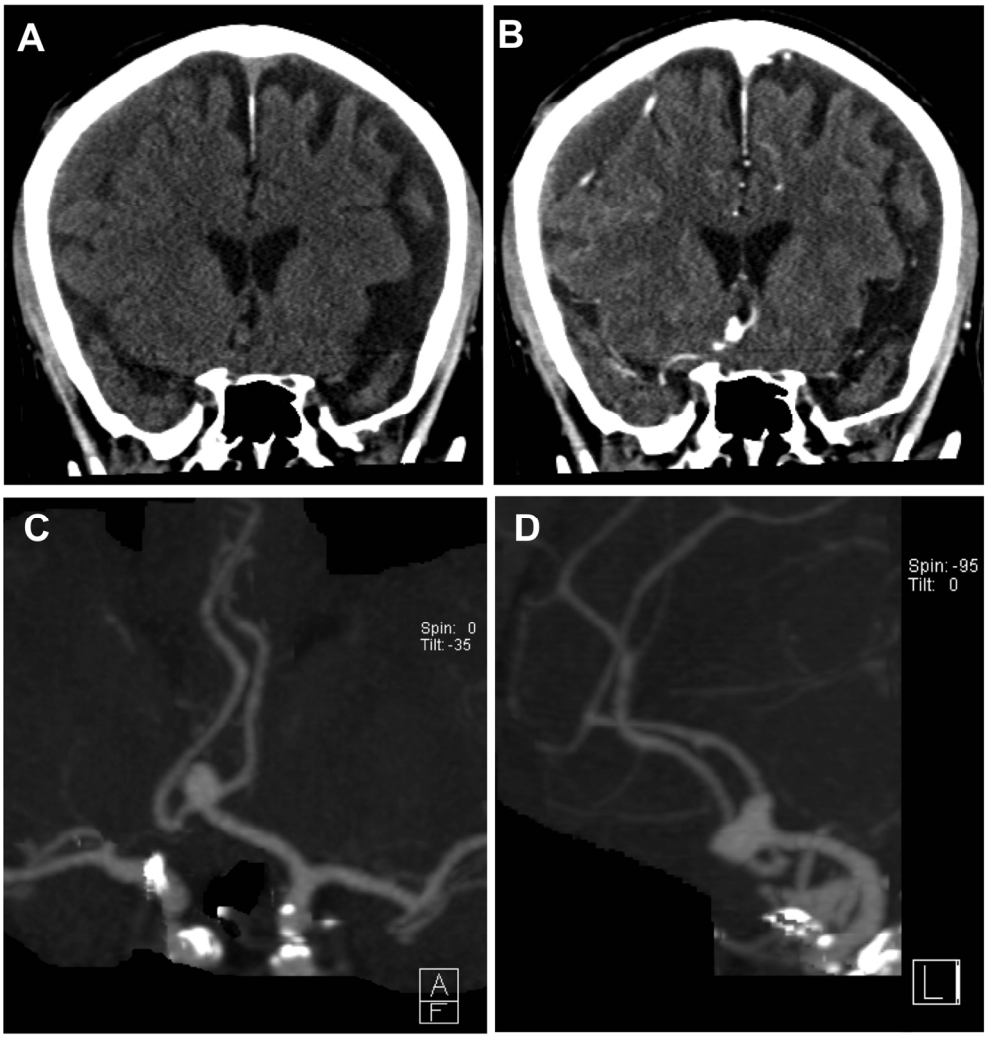
Figure legend

Figure 1: Non-contrast (A) and contrast enhanced (B) coronal CT scan revealing a right-sided chronic subdural hematoma with an incidental anterior communicating artery aneurysm (Acom) aneurysm. 3D CT- angiography illustrates the polylobulated Acom aneurysm in anterior (C) and lateral (D) view.

Figure 2: Comparison of 3D CT- angiography in lateral view at initial diagnosis (A) and 6 weeks follow-up (B) showing clearly the bleb growth of the Acom aneurysm (arrow). Bleb was confirmed with DSA (C) before coiling procedure.

Figure 3: Axial (A, B) and coronal (C) non-contrast enhanced CT scan illustrating the severe SAH with both intracerebral and intraventricular hemorrhage 2 days after the 6 week follow-up appointment.

Figure 4: 3D reconstruction DSA of the ruptured Acom aneurysm (A) and AP (B) and lateral (C) DSA view after coiling of the aneurysm.



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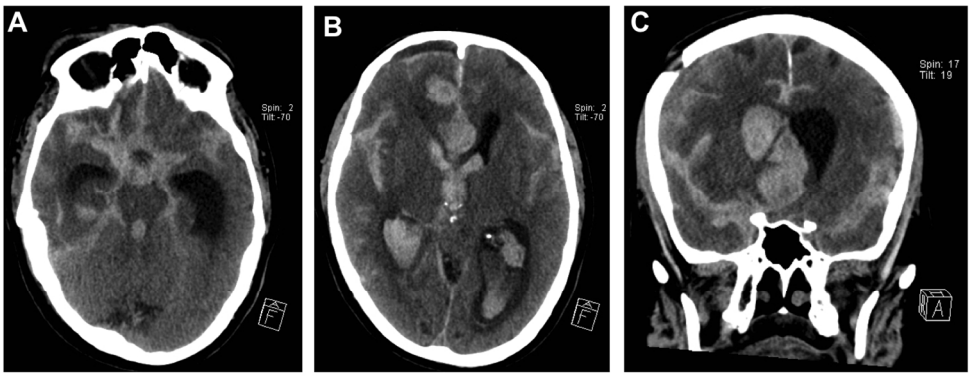

Figure 3: Axial (A, B) and coronal (C) non-contrast enhanced CT scan illustrating the severe SAH with both intracerebral and intraventricular hemorrhage 2 days after the 6 week follow-up appointment.

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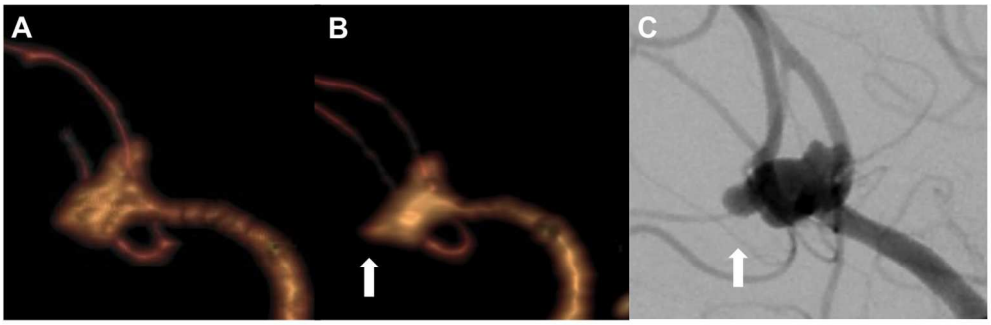

Comparison of 3D CT- angiography in lateral view at initial diagnosis (A) and 6 weeks follow-up (B) showing clearly the bleb growth of the Acom aneurysm (arrow). Bleb was confirmed with DSA (C) before coiling procedure.

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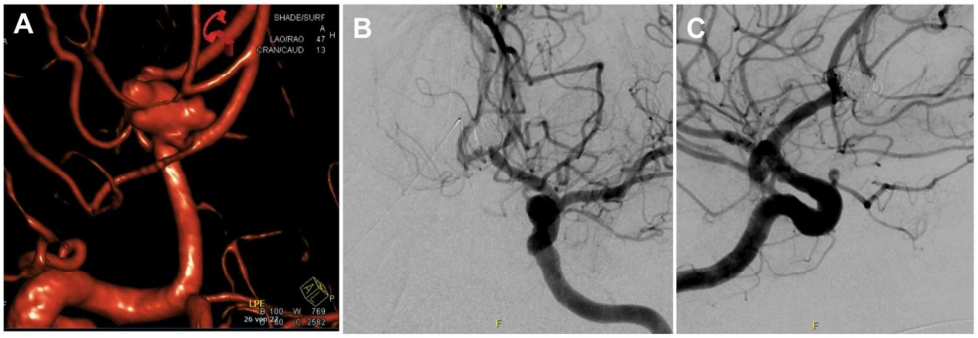

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